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raphy at the Zurich Polytechnic School, has died at the age of fifty-one years.

sary to make their stay there warm and comfortable for the winter. Captain F. P. Evans, R.N.R., by permission of Sir James Mills, chairman of the Union Steamship Company, of New Zealand, will command the *Nimrod* on her voyage to the Antarctic. It is hoped that news from the Antarctic will be received about March or April, 1909.

A TELEPHONE line has been installed to provide means of communication between the Queen Margherita Observatory on the Gniffet Peak, on Monte Rosa, and the observatory lower down the mountain. The carrying out of this line entailed many difficulties; the higher observatory is 14,960 feet above the sea. This building is only open for two months each year in the middle of summer.

UNIVERSITY AND EDUCATIONAL NEWS

THE regents of the West Virginia University, at their meeting in June, voted an increase of 10 per cent. in the salaries of all members of the faculty above the rank of instructor.

THE Board of Education of New York City asks for \$33,031,484.65 for the schools in the coming year, an increase of \$6,258,521.06 over 1908. The increase of about \$5,500,000 for this year is largely due to the proposed increase of teachers' salaries, this alone occasioning an increase in the budget of \$3,273,163.52. It is estimated that the increase in the number of pupils for 1909, will be nearly 25,000. To provide a teaching staff for the increased registration in the elementary schools alone will require employment of 9 men principals, 2 women principals, 3 male assistants to principals, 15 assistants to women principals, 102 men teachers, 636 women teachers, and 82 kindergartners, at a total additional expense of \$136,315.47.

LEIPZIG UNIVERSITY will celebrate the five hundredth anniversary of its foundation in July of next year.

THE foundations of the new hall of engineering of the University of Nebraska have been completed, and work has begun on the superstructure. The sum appropriated for

this building is approximately \$100,000, and it is hoped to have it completed by the opening of the fall semester in 1909.

THE newspapers *Reich* and *St. Petersburger Zeitung*, have been fined \$1,500 each for publishing articles criticizing the policies of Mr. Schwartz, the new minister of education. He is said to have issued an order that all university professors and instructors belonging to the constitutional democratic party should either renounce their political principles or give up their positions.

IT is reported that ten members of the faculty of the College of Physicians and Surgeons, San Francisco, have resigned.

PROFESSOR ARTHUR DEXTER BUTTERFIELD, for ten years professor of mathematics in the University of Vermont, has accepted a similar position in the Worcester (Mass.) Polytechnic Institute, from which he was graduated in 1892 and in which he was formerly instructor.

DR. GEORGE A. COE, professor of philosophy at the Northwestern University, has been appointed to a chair in the Union Theological Seminary, New York City.

DR. ERNST A. BESSY, pathologist in the United States Department of Agriculture, for the past three years in charge of the United States Subtropical Laboratory of Miami, Florida, has been elected to the professorship of botany in the University of Louisiana, at Baton Rouge. He will assume his new duties on October 20.

LIEUT.-COLONEL BOURGEOIS, chief of the geodetic section of the French Army Geographical Service, has been appointed to the chair of astronomy and geodesy in the Paris École polytechnique, vacant by the resignation of M. Poincaré.

DISCUSSION AND CORRESPONDENCE

SCHAEBERLE AND GEOLOGICAL CLIMATES

TO THE EDITOR OF SCIENCE: In Professor Schaeberle's last communication to SCIENCE, June 5, p. 894, he makes the statement that "it now rests solely with the scientists to demonstrate, if possible, that some vital flaw exists in my (Schaeberle's) published work (upon the effective surface temperature of

the sun and the temperature of space); so long as this can not be done, 'most modern theories' of geological climate must certainly be regarded as 'upset,' *for these theories are based upon an adopted value for the temperature of space which is* (according to my [Schaeberle's] demonstration) *too great by nearly three hundred degrees of the centigrade scale at the earth's distance from the sun, etc.*" (italics original).

Statements as sweeping as these in the columns of SCIENCE, as pointed out by Lane in answer to an earlier communication, appear to call for some comment for the benefit of those of your readers who are neither geologists nor astronomers. In answer it may be stated that an inspection of recent geological literature in the special mediums of geological publication shows that all articles dealing with actual details of geological climates are based *not upon considerations of the temperature of space*, but upon *detailed studies of the geological record*. It is the effort of modern theory upon ancient climates to meet this evidence and the lines of theory are determined by the definiteness and complexity of the facts to be explained rather than by any assumption in regard to the temperature of space.

A generation ago, when but little was definitely known in regard to geologic climates, theoretical calculations as to what conditions could, should, or would have prevailed at the base of the atmosphere, would have had some weight. At present a study of the stratigraphic record to find what actually were the conditions is much more definite and profitable. The results of such study have been to show an oscillation of widespread climatic conditions from glacial to torrid and from humid to semi-arid, or arid, reaching back to the very beginning of the sedimentary rocks; extreme oscillations of shorter period being superimposed upon others of more general character and æon-long in their duration. At times climates appear to have been widely uniform, a feature whose explanation has been sought in hypotheses of changes in character of lands,

in ocean currents, in atmospheric composition, or in solar diameter. But at other times, as in the Permian, climates seem to have been distinctly local, though the geologic, or time, contrasts in climates have been in general more striking than the geographic, or space, variations. Perhaps the heaviest blow which has been struck recently at the older hypothesis of a simple climatic evolution from a primitive, uniform, torrid condition is found in the work of Coleman, who has presented the evidence of a glacial period practically at the beginning of the sedimentary record in North America. The advance of knowledge in regard to geological climates, as in so many other fields, has been away from simplicity toward complexity.

In view of these conclusions by well-qualified geologists Manson's hypothesis of an earth self-heated and protected by a cloud envelope until the Tertiary, which Schaeberle considers that he has demonstrated as a true theory, and which has recently been picturesquely written up by Percival Lowell for the *Century* magazine as the assured dictum of geology, must be regarded as in no measure adequate to explain the facts. If that hypothesis is not to be relegated to the scientific scrap heap it must either be very greatly modified or its supporters must break down the conclusions in regard to geologic climates which have made it unavailable as an explanation. Until this is done it must be regarded as an unsupported speculation.

It would also add definiteness to that hypothesis if its advocates would make it quantitative by stating the amount of thermal energy now actually delivered by the earth's interior to its surface in unit time, basing this calculation upon the thermal conductivity of rock and the temperature gradient. For applying the hypothesis to past times the favorable sub-hypothesis should be postulated of assuming that the earth is simply a cooling body unwarmed by radio-active or other internal activities, since this permits a more rapid delivery of heat in the past. For the purposes of such a calculation also, the surface may be assumed to have remained of

practically constant temperature, compared to the earth's interior; since by the terms of the hypothesis the soil has been the seat of living beings during much of the time of cooling.

Furthermore, the rate of outflow of heat is determined solely by the temperature difference on the two sides of a rock layer, and a cloud envelope could only retard such outflow through materially raising the temperature of the surface rock and diminishing the temperature difference on the two sides of the outer zone. This is something which, as shown above, has not taken place, and consequently the delivery of thermal energy from the interior to the surface of a cooling earth may be computed for any fraction of its age. The evolution of life must be restricted to the later portions of the hypothetical cooling process, since, as Lane has pointed out,¹ rocks seem to have been buried in early times to as great a depth as now without metamorphism, save where mashed or injected. To cite a specific instance—the Belt terrane of Montana and Idaho shows formations which were buried to a depth of several miles in pre-Cambrian times, now almost if not quite as unmetamorphic as the Triassic formations of the eastern United States.

The actual thermal energy per unit time now and in past times received from the earth's interior, thus computed, could be compared with that determined by measurement as received in unit time from the sun and without reference to the actual temperatures of either earth or sun. Even in spite of much error in regard to the fundamental constants, unless some surprising error in previous methods is developed, such a calculation would show the earth to contribute but a negligible fraction and would indicate to what an extent a hypothetical cloud envelope and early atmosphere of assumed composition would have to operate as an impermeable blanket to make up for the hypothetical deficiency in solar radiation. Having drawn this thermally opaque envelope about the

earth, the Mansonians must next demonstrate how light was able to penetrate to permit the building up of vegetable protoplasm and give employment to the eyes of animals during the Paleozoic and Proterozoic ages.

JOSEPH BARRELL

QUOTATIONS

THE PUBLIC HEALTH

PROFESSOR WILLIAM T. SEDGWICK'S address on "The Call to Public Health" has been printed in a recent number of *SCIENCE*, and the perusal of it can not fail to be instructive and inspiring. The health of the public must necessarily be based upon the health of individuals, yet when one speaks of the public health he has in mind something much broader and much more important than the health of isolated members of the community. The public health means the health question socialized, and this broadening of the base so as to include whole populations has arisen from the conception, made vital by modern science, that the health of the individual immediately concerns his family, his neighbor and his city. There is a community of interests vitally affecting human life which makes the public health of importance to the municipality and the state; and, as Professor Sedgwick easily shows, this is a development that has come very late in modern civilization, and to-day calls for a greater degree of attention than has ever before been given to it.

A certain selfishness, or indifference to others, that has naturally resulted from the old individualism, has until recent years blinded the majority of people to the necessary relation between individual and public health. The main concern of the average man has been to keep himself and his family well; all others he had no interest in. He paid the doctor's bills for professional services in the family circle, and there his responsibility ended. Modern science has shaken this form of indifference by demonstrating the preventability of most contagious and infectious diseases. Epidemics have been studied enough to convince the average man that their spread in a normal, civilized community is nothing

¹ *SCIENCE*, April 10, 1908, p. 591.